# Broadband Wireless Standards

Outputs

- Preparation of technical standards and documents for the ITU-R that support the U.S. interest in broadband wireless systems.

- Development of new radio propagation algorithms or methods that improve spectrum usage of wireless systems.

Wireless communication has seen tremendous growth in recent years, in both the number of users and the types of new services. In particular, there has been an emphasis on Internet and broadband data uses, over and above voice applications. These additional users and services require greater bandwidths than before, which for wireless users means more radio spectrum. As growing numbers of users require ever more spectrum, it is necessary to be able to predict signal coverage for various wireless services more accurately, so that inter-service spectrum sharing can occur without causing harmful interference to incumbents and new users/services. The development of radio-wave propagation prediction models for accurate prediction of signal coverage supports standards for these broadband wireless systems.

Historically, radio propagation model development tended to be very service specific, with models for the broadcast FM radio and television service or for the land mobile radio service, and little or no overlap in applicability between the models for different services. This service-specific approach was adequate for a regulatory philosophy that assigned
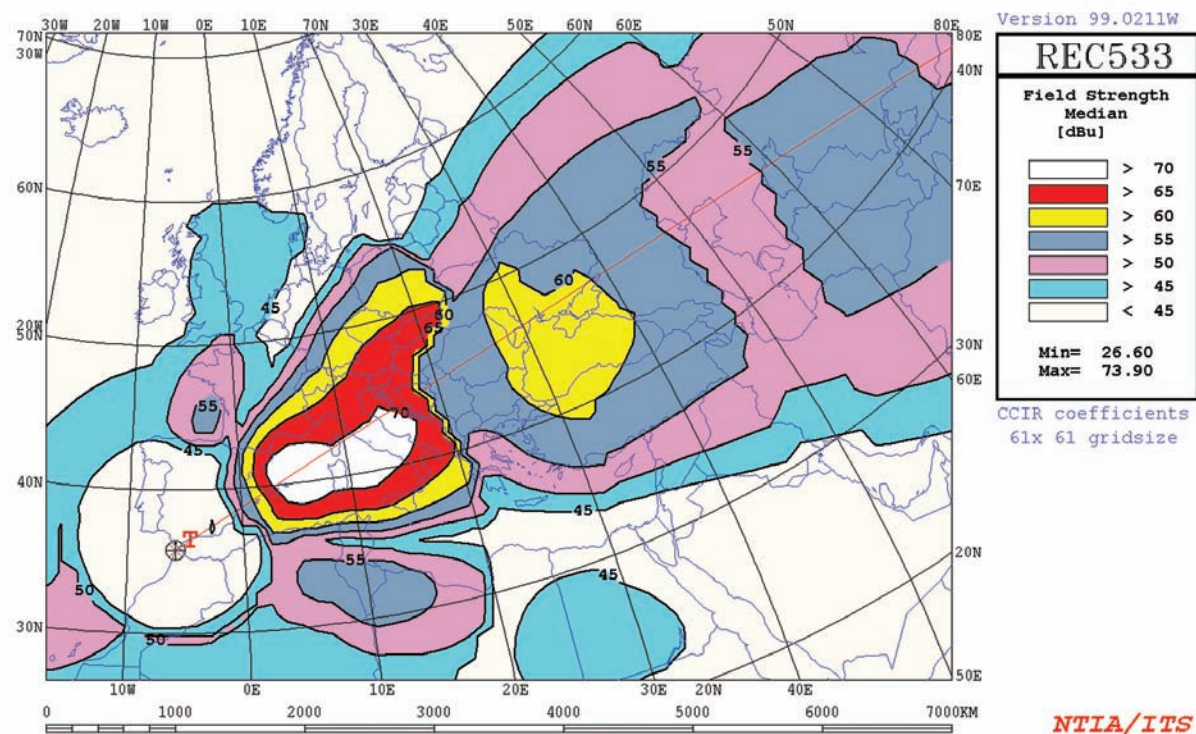
Output from the High Frequency propagation software for international frequency coordination, developed by the ITU and maintained by ITS.

different, exclusive blocks of the radio spectrum to different services in a proprietary fashion. However, this lack of overlap between models can also create an impediment to the shared use of spectrum by different services or wireless applications, because, for example, a model that is used to predict intra-service system availability and interference might not apply flexibly and accurately to inter-service interference predictions. To overcome this problem, ITS and other research organizations have been developing and evaluating propagation models to predict wireless signal coverage more accurately and flexibly, both within and across services.

ITS participates in the international development of radio propagation prediction model standards that can be used by spectrum managers and system planners of land mobile, terrestrial broadcast, maritime mobile and certain applicable fixed (e.g., point-to-multipoint) services, among others. ITS supports this effort by participation in the International Telecommunication Union's Radiocommunication Sector (ITU-R) Study Group 3 (Radiowave Propagation). The most recent meetings of the Working Parties (WP) of Study Group 3, held in Cleveland, Ohio, in late September and early October, 2005, were jointly sponsored by the National Aeronautics and Space Administration (NASA) and ITS. Four ITS engineers participated in these meetings as members of the official U.S. delegation.

Study Group 3 recently developed and adopted a radio propagation model which blends features that the different services had used independently, thereby clarifying and unifying planning and coordination activities across these services. This recommendation, Rec. ITU-R P.1546, is usually considered to be a site-general model, although for improved accuracy it specifies numerous adjustments and corrections to the basic method that are very nearly site-specific in their application. Numerous aspects of Rec. ITU-R P.1546 have been adopted by the Regional Radio Conference (RRC-04)[1] as the basis for planning and coordination studies within the Conference's planning area. To support the work of the Intersessional Planning Group (IPG) and to prepare for the second and final meetings of the Conference (RRC-06), Study Group 3, WP 3K (point-to-area propagation) and, in particular, Subgroup 3K-2, have undertaken a number of revisions to the Recommendation. For

[1] The RRC-04 is the first of two scheduled sessions of the international conference to establish agreements and standards for the coordination and planning of digital terrestrial broadcast services (radio and television) in parts of the ITU-R's Regions 1 and 3 of the world.

several years, an ITS engineer has served as chairman of Subgroup 3K-2.

As a much needed adjunct to this work, Subgroup 3K-1 of WP 3K is examining five proposed site-specific models for intra- and inter-service planning and coordination uses, when detailed terrain elevation data are available. Two of these models, the ITS Irregular Terrain Model (ITM) and a closely related hybrid model based on Recommendations ITU-R P.1546 and P.452, originated in contributions to WP 3K from the U.S. Administration which were authored by ITS. ITS has established a password protected worldwide website for participants in Subgroups 3K-1 and 3K-2 to exchange propagation measurement data and terrain profiles for use in testing and comparing these models. As part of this testing and comparison effort, ITS will contribute model source code and U.S. radio propagation measurement data.

In addition to the above areas, WP 3K deals with propagation aspects of short-path personal communications and wireless local area networks in the frequency range 300 MHz to 100 GHz in Subgroups 3K-3 and 3K-4, both of which are longstanding. At the most recent meetings of WP 3K, the Chairman of WP 3K established a new subgroup, Subgroup 3K-5, to address ultrawideband radio signal propagation. Based on a U.S. contribution authored by ITS, a draft new recommendation on ultrawideband propagation was extensively improved and revised.

ITS also participates in the work of Working Parties 3J (propagation fundamentals), 3M (point-to-point propagation, earth-space propagation and interference and coordination) and 3L (ionospheric propagation). ITS continues to be responsible for maintaining the HF (3-30 MHz) propagation software developed by the ITU-R for international frequency coordination. The ITU-R website, http://www.itu.int/ITU-R/software/study-groups/rsg3/databanks/ionosph/index.html links to an ITS website for HF propagation models for the authoritative source code for HF sky-wave propagation (Rec. P.533). This website also makes two ITS developed HF propagation models, ICEPAC and VOACAP, available for downloading. An example of the type of output that the Rec. P.533 software can produce is shown in the figure.

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